



APPLICATION OF FUZZY ANALYTICAL HIERARCHICAL PROCESS IN TEACHER'S RANKING

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ABSTRACT

For any nation, education and research is an important factor in development of a country and society. Education is must for everyone for his/her social, mental and overall development. In this process also our government is operating many campaigns for better education to every child of a nation. So in any education institute, teachers are the main functioning body and results of students are affected by the performance of teachers. So now days it is major problem to select best teacher for any institute, today in this 21st century of digital and competitive world apart from good academic record and experience teachers should also well resourceful and versatile to students, so ranking and selection of teachers on the basis of qualitative data is always contradicted and difficult. The objective of this paper is to apply Fuzzy Analytical hierarchical process and its various methods to determine the important criteria or parameter for teacher's ranking and then give ranking to teachers using various methods. The real numerical finding results have also been demonstrated. In this paper it is shown that Fuzzy Analytical hierarchical process is capable to smoothly handle the fuzziness of data involved in qualitative criteria of teachers.

KEYWORDS: Fuzzy AHP, Multi Criteria Decision Making, Teachers' Selection and ranking.

1. INTRODUCTION

Teachers play an amazing part in the lives of students for the formative years of their overall development, they engage themselves in molding their students into liable citizen of their country and they are responsible for the overall development of the students like scientific knowledge, social knowledge, moral values and general awareness. So teachers should be well qualified as well as has other versatile and multitalented nature so he can give his best to students. According to Moayeri et al. (2015), the most important organizational system in every country which has a great influence on the countries' future is the Educational system. Moayeri et al. (2015) considers students and teachers as the two main pillars in the academic institutions, without which the development of the education system is impossible [1]. Accordingly now in 21st century everyone is having good education degrees and academic records so among them it is hard to find a best teacher with versatile nature other than education degree. Now a day every educational organization is facing the same problem. So using Fuzzy Analytical Hierarchical process we can work on qualitative criteria and find the ranking of teachers and choose best teacher among pool of alternatives. FAHP is useful in giving ranking according to qualitative data of teachers like creativity, communication skill, presentation skill, knowledge, social awareness, decision making, attitude towards students, personality etc.

2. METHODOLOGY

Fuzzy logic introduced by L.A. Zadeh (1965) gives us a language, with syntax and local semantics, in which we can translate our qualitative knowledge about the problem to be solved. Fuzzy logic allows expressing this knowledge with subjective concepts such as very good, good, average and poor which can be mapped into exact numeric ranges [8]. Multiple criteria decision making (MCDM) refers to making decisions in the presence of multiple, usually conflicting, criteria. MCDM problems are common in everyday life [6]. MCDM is useful in ranking teachers based on the conflicting criteria such as communication, knowledge, presentation, decision making skills of teachers.

AHP is one of the most famous methods for making multi-criteria decisions called the Analytic Hierarchy Process or AHP. The Analytic Hierarchy Process (AHP) is a theory of measurement through pair wise comparisons and relies on the judgments of experts to derive priority scales. It is these scales that measure intangibles in relative terms [7]. AHP was developed to optimize decision making when one is faced with a mix of qualitative, quantitative, and sometimes conflicting factors that are taken into consideration. The AHP is a decision support tool which can be used to solve complex decision problems. To deal with the kind of qualitative, imprecise information or even ill structured decision problems, fuzzy set theory is suggested by (R.E. Bellman, L.A. Zadeh 1960) as modeling tool for complex systems that can be controlled by humans but are hard to define exactly [8].

TABLE 1: Membership function of M1, M2, M3, M4, M5

Linguistic Term	Fuzzy Number	Crisp Score
Low	M ₁	0.115
Below average	M ₂	0.295
Average	M ₃	0.495
Above average	M ₄	0.695
High	M ₅	0.895

TABLE 2: SAATY'S NINE POINT SCALE

Scale	Compare factor of i and j
1	Equally important
3	Weakly important
5	Strongly important
7	Very Strongly important
9	Extremely important
2,4,6,8	Intermediate value between adjacent scales

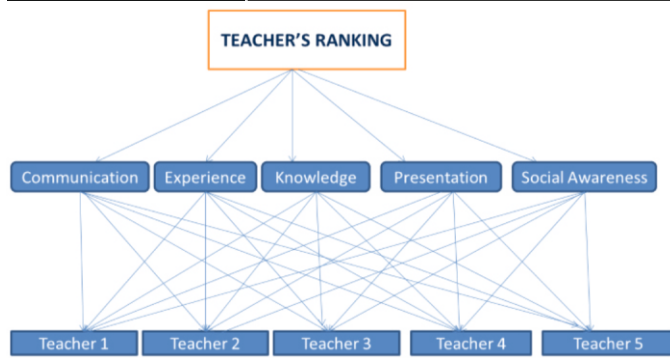
Demonstration of the method: Now, the 5-point scale is considered to demonstrate the conversion of fuzzy number into crisp scores. To demonstrate the method, a 5-point scale having the linguistic terms like low, below average, average, above average and high are considered in Table 1 and Satty have also given 9-point scale, that scale weights have been used in our experimental process, then we have applied the formulas of FAHP, that formulas have been mentioned by Hota H.S. Et al [4]. They have used formulas with demonstrative example.

2.1 Proposed Approach:

In this paper, using Fuzzy Analytical Hierarchical process we are going to give ranks and choose best teacher among pool of teachers. FAHP and its methods are useful in evaluating conflicting criteria which are qualitative in nature. To evaluate teachers ranking qualitative conflicting criteria may be communication, experience, presentation, knowledge, social awareness, decision making, dressing sense and attitude towards students etc.

So among above criteria according to some experts we have chosen only five criteria to give ranking to teachers are communication, qualification, knowledge, presentation and social awareness.

to be conscious of the difficulties and hardships of society.



2.2 The various criteria we have used are:

- **Communication:** The teacher's communication skill should be good enough that every student easily understand what teacher is teaching in the class. They easily interpret all information provided by the teacher.
- **Experience and Knowledge:** The combination of knowledge and practical experience is a valuable asset to your professional life, as it makes you a skilled person to carry out your task successfully. Both knowledge and experience are closely related to each other. In the sense, without knowledge you may not gain practical experience and in the absence of practical experience, your knowledge and concepts cannot be strengthened. Also experience must be considered as a part of knowledge that comes through experiments or doing things practically.
- **Presentation Skill:** Presentation skills are the skills you need in delivering effective and engaging presentations to a variety of audiences. These skills cover a variety of areas such as the structure of your presentation, the design of your slides, the tone of your voice and the body language you convey.
- **Social Awareness:** Social awareness is defined as being aware of the problems that different societies and communities face on a day-to-day basis and

2.3 Teachers as alternative:

As in this paper we are going to give ranks to teachers according to their Qualitative criteria using the concept of FAHP and its methods. Now in this competitive world of 21st century, for any job, pool of candidates appears in recruitment test. So after taking preliminary test and interview, at last we may get selected five best candidates of same capability and academic record among them, so at that moment again to choose best from these five candidates we can apply our method. Using this method we can easily determine ranks of candidates and select best one.

3. EVALUATION OF WORK:

Here teacher's criteria like communication skill, presentation skill, qualification, knowledge and social awareness are assigned marks with respect to each criteria and pair wise comparison of teacher to teacher are calculated with the help of methodology steps and above methods and the ranking of the teacher is evaluated according to values of Satty's scale in Table 3. Decision makers assigned Satty's scale values to teachers according to different criteria.

TABLE 3: Teachers got weights for each criterion i.e. from C1 to C5

	C1	C2	C3	C4	C5
T1	0.495	0.695	0.115	0.495	0.495
T2	0.295	0.695	0.495	0.295	0.495
T3	0.295	0.115	0.495	0.295	0.495
T4	0.695	0.695	0.495	0.495	0.495
T5	0.695	0.695	0.495	0.495	0.695
T6	0.495	0.695	0.115	0.295	0.895
T7	0.295	0.495	0.695	0.495	0.695
T8	0.895	0.295	0.115	0.695	0.495
T9	0.895	0.295	0.495	0.695	0.295
T10	0.495	0.295	0.115	0.695	0.695

TABLE 4. Criteria to Criteria comparison table

	C1	C2	C3	C4	C5	GM	A2	A3	A4	LEMDA MAX	CI	CR
C1	1.000	3.000	1.000	4.000	0.500	1.431	0.253	1.383	5.470	5.544	0.136	0.122
C2	0.330	1.000	0.250	1.000	0.200	0.440	0.078	0.412	5.293			
C3	1.000	4.000	1.000	1.000	0.330	1.057	0.187	1.000	5.352			
C4	0.250	1.000	1.000	1.000	1.000	0.758	0.134	0.810	6.053			
C5	2.000	5.000	3.000	1.000	1.000	1.974	0.349	1.937	5.554			
TOTAL GM				5.660								

First of all we calculate the pair wise comparison for criteria to criteria from which we got value of CR = 0.122 in Table 4, then we check for value of CR. In above table, We have CR > 0.1 which shows that our values are consistent, After

that again we assign the weights for teacher to teacher for each criteria and again we check for consistency in the Table 3 for criteria communication (C1) and after it we got the value of CR = 0.188 in Table 5.

TABLE 5: Pair wise comparison of each teacher for criteria C1

C1 – COMMUNICATION																	
	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	GM	A2	A3	A4	LEMDA MAX	CI	CR
T1	1	3	1	4	1	1	2	1	2	1	1.473	0.143	1.641	11.453	12.524	0.280	0.188
T2	0.33	1	1	3	5	1	3	0.33	3	1	1.311	0.128	1.662	13.032			
T3	1	1	1	4	3	1	0.5	4	0.33	1	1.231	0.120	1.472	12.292			
T4	0.25	0.33	0.25	1	1	0.5	1	3	0.5	1	0.660	0.064	0.785	12.232			
T5	1	0.2	0.33	1	1	0.5	2	1	1	1	0.763	0.074	0.872	11.759			
T6	1	1	1	2	2	1	0.33	2	0.5	1	1.029	0.100	1.105	11.042			
T7	0.5	0.33	2	1	0.5	3	1	4	1	1	1.072	0.104	1.369	13.129			
T8	1	3	0.25	0.33	1	0.5	0.25	1	5	1	0.831	0.081	1.349	16.701			
T9	0.5	0.33	3	2	1	2	1	0.2	1	1	0.912	0.089	1.183	13.324			
T10	1	1	1	1	1	1	1	1	1	1	1.000	0.097	1.000	10.281			
Total GM											10.281						

After that we got the normalized weights for each teacher wise and each criteria wise. Table 6 shows the normalized values of each teacher by applying the formula and got the ranking of each teacher for over all criteria. Table 7 shows values of weights of each alternative and highest value of weights indicates the higher rank so here Teacher 1 secured 1st Rank with highest value as 0.124 and other teachers also get values and respective ranks.

TABLE 6: Normalized weights of each teacher

Weights	0.253	0.078	0.187	0.134	0.349
	C1	C2	C3	C4	C5
T1	0.143	0.132	0.140	0.095	0.111
T2	0.128	0.121	0.082	0.072	0.100
T3	0.120	0.084	0.109	0.133	0.109
T4	0.064	0.086	0.123	0.130	0.117
T5	0.074	0.110	0.098	0.070	0.084
T6	0.100	0.088	0.085	0.067	0.089
T7	0.104	0.102	0.072	0.079	0.109
T8	0.081	0.098	0.115	0.139	0.093
T9	0.089	0.091	0.087	0.063	0.104
T10	0.097	0.088	0.087	0.150	0.085

Table 7: Ranking of Teachers

Teachers	Weights	Ranks
T1	0.124	1
T2	0.101	4
T3	0.113	2
T4	0.104	3
T5	0.084	10
T6	0.088	9
T7	0.096	7
T8	0.101	4
T9	0.090	8
T10	0.098	6

4. CONCLUSION:

This paper shows the selection procedure for most suitable teacher for their academic institution or educational organizations. Here we have used the concept of Fuzzy AHP method and to determine the normalized weights of five criteria based on the Satty's scale by pair wise comparison have been done and also we have checked the consistency of weights. After that we again did the pair wise comparison for teacher to teacher for each criterion and also check the consistency for weights. Here we have applied Fuzzy AHP to normalized weights of teachers and at last we get ranks of teachers and alternative 1 got 1st rank. This method is very useful method for selection and calculating ranks for any type of alternatives not only for teachers.

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